**Updated: 3/6/12**

# Sampling and Extrapolation Process

## For Office of Program Integrity (OPI)

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## Definition Section

"Audit period" - The time period the department selects to review a provider's records. This time period is indicated in the audit report.

"Extrapolation" - The methodology of estimating an unknown value by projecting with a calculated precision (i.e., margin of error) the results of an audited sample to the universe from which the sample was drawn.

"Random" - A scientific method of ensuring that each claim in the claims universe has an equal chance of being included in the audit sample.

"Sample" - A selection of claims or procedures reviewed under a defined audit process.

“Simple Random Sample” – A sampling methodology which offers an equal chance for any individual (paid claim) to be selected from a population (paid claims universe).

“Stratified Random Sample” – A sampling methodology which involves the division of a population (paid claims universe) into smaller groups, known as strata. The strata are formed based on their members sharing a specific attribute or characteristic (reimbursement amount).

"Universe" - A defined population of claims submitted by a provider for payment during a specific time period.

## Purpose of audit sampling and extrapolation

The Office of Program Integrity uses statistical sampling in auditing Medicaid and Medical Assistance service providers. Sampling and extrapolation are standard audit practices which reduce the cost of auditing in exchange for accepting a small amount of risk in the results.

When a sample is obtained randomly, it is possible to state, with a stipulated degree of confidence that the number of errors in the sample applies proportionately to the unsampled portion of the universe as well. The alternative to sampling is to audit the entire universe. This increases the time and costs to conduct the audit and also causes additional time, disruption and resources from the provider to complete the audit.

Goals of sampling and extrapolation are to produce:

- Clearly defined and relevant universes

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- Statistically valid random selected samples, either simple or stratified
- Criteria for the quality/validity of a sample
- Extrapolation/projection of findings from the sample to its universe
- Adjustment for sampling risk when determining the overpayment (ie, the “fair adjustment”)

## Universe and Sample Selection Processes

Statistical methods described in books such as, Sampling Techniques by William C. Cochran, have been used to build the claims sampling program in the Fraud and Abuse Detection System (FADS) used by OPI. The automated statistical procedures in the FADS comply with generally accepted statistical audit and governmental accounting standards and meet the requirements of the United States' Department of Health and Human Services (DHHS).

Once the provider is selected, the FADS produces a claims profile of up to 36 months of claims from the payment history in ProviderOne. (Please note: OPI is not limited to 36 months of data it can audit. But, it is a general practice to look at 36 months worth of data for most audit purposes.) This history of paid claims is called the "audit claims universe." The FADS calculates the statistical characteristics of the audit claims universe and produces a statistical sample of claims for the department's auditors to review. Since the focus is on paid claims for amounts paid greater than zero, claims paid at zero and Medicare crossover claims are excluded.

The FADS computerized sampling program is programmed to randomly select the actual sample of claims from the provider's audit claims universe. For sampling purposes, a "Claim" is each item/service billed by a provider to the Washington State Medicaid and Medical Assistance programs and paid by the State’s Department of Social and Health Services.

*Please note:* The provider’s universe is organized in one of two ways, by claim line or by recipient. The organization (claim line versus recipient) of the audit universe is based on auditor judgment.

### Random Sample Selection Methods

Random Number Generator (RNG)

Selection of claim lines or recipients is conducted without bias using a random number generator. OPI uses a random number generator designed by Wichman and Hill which have been independently tested with both the National Institute of Standards and Technology (NIST) test battery and an independently developed battery of test known as Diehard. The RNG is used for both simple and stratified random sampling.

<u>Simple Random Sample</u>
A method for drawing a sample from a population/universe, such that all samples of a given size have equal probability of being drawn. This common approach is more effective when selecting a sample based on recipient, which is typically one record for each recipient when a provider has a small recipient population. It is generally faster to select recipient cases and review all the paid claims for that recipient versus a sample of various claim lines.

<u>Stratified Random Sample</u>
The stratified random sample is more likely to lead to greater precision or a closer approximation to the popular mean. This approach is more effective when reviewing a large volume of paid claims. The claims are segregated into twenty-one (21) strata. Each stratum is sampled independently. Stratum twenty-one (21) includes the top twenty-five (25) highest paid claim line amounts and is separated before the remainder of the population is stratified. Strata one (1) through twenty (20) are based on claim line paid amounts. A typical audit has a minimum sample size of 300 claim lines.

<u>Validity of the stratified random sample</u>
The validity of the sample is verified pre-audit. In order to be valid and to justify the projection of the findings to the claims universe, the statistical sample must adequately represent the provider's claims universe. Therefore, the FADS are programmed to determine the necessary size of an audit sample to ensure a 95 percent confidence level. In determining the necessary sample size, the FADS takes into consideration the number of claims in the claims universe and their values. The FADS applies tests to determine if any variables in the claims universe might affect the statistical validity and reliability of a sample. The claims universe characteristics examined are: the standard deviation, the means squared, and the variance.

The validity of the sample is checked by reviewing the correctness of the allocation of trial strata into detail strata. This is done by calculating that there are no detail strata with more than 3% of the claims. Further validation tests are conducted to ensure that each sample strata have a minimum sample size of eight (8). Means tests for representativeness of the sample are also conducted. The sampling program tests the mean of a sample's paid amounts against the mean of a universe's paid amounts and requires that the difference be not significant at the 95% level of confidence.

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<u>Extrapolation/projection of findings</u>

The process of projecting or estimating measures a characteristic of a universe based on the same characteristic in a sample drawn from that universe. OPI uses a regression estimator to calculate the projected overpayment. The regression estimator is known to have the <u>least</u> margin of error with overpayment estimation.

<u>Adjustment for sampling risk</u>
OPI employs a commonly used fair adjustment to make any uncertainty of the estimate more acceptable. This adjustment is designed to change the odds faced by the provider to a 95% probability that the true universe value is higher, versus a 5% probability that it is lower, i.e., the provider's odds are 19 to 1 that they would fare worse with a full audit. Again, a full audit will increase costs for both the provider and OPI.

This "fair adjustment" is calculated by multiplying the critical one-tailed 95% value for the standardized Normal Distribution, by the standard deviation of the universe estimate. This adjustment is known to be strongly biased in favor of the provider. To counterbalance this bias, OPI can take legitimate measures to reduce the variance of the estimate, the other factor in the adjustment. The four measures OPI takes are:

1) Stratified sampling;
2) Requiring a sample size that will support precision of 5% or better 95% of the time;
3) "Optimal" sample size allocation; and
4) Use of a regression estimator for extrapolation.

## <u>The basis of OPI audit sampling and extrapolation</u>

The core of OPI's documentation on audit statistics consists of opinions and validations from independent experts on the topic. A practical definition of well-established statistical techniques is a book by William G. Cochran[1] (1977), *Sampling Techniques,* John Wiley and Sons, New York, third edition.

OPI's software implementation of these techniques have been evaluated and validated by an independent expert, Dr. John W. Leo (2005) with the firm of Milliman (Seattle)

The major cost factor is the practical impossibility of completely auditing in a timely manner with a huge number of transactions recorded in a modern electronic administrative database, as suggested by Herbert Arkin (*Sampling Methods for the Auditor: An Advanced Treatment*, McGraw-Hill, NY, 1982, p.2).